

disposable absorbent articles (US-A-5,331,015 [1]), of insulating articles (US-A-5,770,634 [2]) and of filtration membranes and devices (WO-A-97/37745 [3]).

5 In order to further broaden their application potential, the inventors set themselves the objective of providing polyHIPE foams having cells with the smallest possible diameter, while maintaining a low density.

10 Moreover, they set themselves the objective of providing polyHIPE foams which have, in addition to the abovementioned properties, a very high degree of purity and which can be prepared by a process that is simple to implement and which is compatible
15 economically with manufacture on the industrial scale.

SUMMARY OF THE INVENTION

These objectives, and others besides, are achieved by the present invention, which proposes a
20 polyHIPE foam formed from a crosslinked, exclusively hydrocarbon, polymer based on styrenic monomers and having a density of 40 to 260 mg/cm³ and cells with a mean diameter of 10 micrometers or less.

According to a first advantageous
25 embodiment of the invention, the polymer is a styrene/divinylbenzene copolymer.

This copolymer may especially be obtained from commercially available styrene and divinylbenzene monomers, in which case the divinylbenzene is composed
30 of a mixture of the three, ortho, meta and para, isomeric forms, with the meta form being predominant.

Advantageously, in this copolymer, the styrene/divinylbenzene weight ratio is between 5 and 1, preferably equal to 4 or approximately equal to 4.

5 According to the invention, the foam preferably has cells with a mean diameter of between 1 and 5 micrometers.

 According to another advantageous embodiment of the invention, the foam has a mass
10 content of impurities of less than 3%, or even less than 2%, that is to say the elements present in this foam other than the constituent carbon and constituent hydrogen of the polymer, represent less than 3%, or even less than 2%, by weight of said foam.

15 A foam according to the invention may especially be obtained by introducing, into a conventional process for highly concentrated internal phase emulsion polymerization, an additional step that consists in subjecting the emulsion to shear in order
20 to reduce the diameter of the water bubbles that it contains, before the polymerization is carried out.

 The subject of the invention is therefore also a process for manufacturing a polyHIPE foam as defined above, which comprises the following steps:

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 a) an emulsion between an organic phase, comprising exclusively hydrocarbon styrenic monomers and a surfactant, and an aqueous phase, comprising an electrolyte and a

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alcohol extraction operations, for example in a Soxhlet extractor.

The alcohol used during these operations is preferably ethanol.

5 In accordance with the invention, the foam is preferably dried in an oven, at a temperature of around 60°C, for example for about 12 hours.

10 Other characteristics and advantages of the invention will become more clearly apparent on reading the remainder of the description which follows, which is given, of course, by way of illustration and without implied limitation and with reference to the appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

15 Figure 1 represents three photographs taken using a scanning electron microscope on a sample of a first example of foam in accordance with the invention, part A corresponding to a magnification of $\times 28$, part B to a magnification of $\times 127$ and part C to a
20 magnification of $\times 1960$.

Figure 2 represents, in the form of a histogram, the frequency (F) of the cells of a sample of the first example of foam illustrated in figure 1 as a function of the diameter (D) of these cells,
25 expressed in micrometers.

Figure 3 represents, in the form of a histogram, the frequency (F) of the pores of a sample of a foam in accordance with the invention as a function of the diameter (D) of these pores, expressed
30 in micrometers.

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Figure 4 represents three photographs taken using a scanning electron microscope on a sample of a second example of foam according to the invention, part A corresponding to a magnification of $\times 32.3$, part B to a magnification of $\times 126$ and part C to a magnification of $\times 1990$.

Figure 5 shows, in the form of a histogram, the frequency (F) of the cells of a sample of the second example of foam illustrated in figure 4 as a function of the diameter (D) of these cells, expressed in micrometers.

Figure 6 shows, in the form of a histogram, the frequency (F) of the pores of a sample of the second example of foam illustrated in figure 4 as a function of the diameter (D) of these pores, expressed in micrometers.

Figure 7 shows three photographs taken using a scanning electron microscope on a sample of a third example of foam according to the invention, part A corresponding to a magnification of $\times 30.9$, part B to a magnification of $\times 129$ and part C to a magnification of $\times 1940$.

Figure 8 shows, in the form of a histogram, the frequency (F) of the cells of a sample of the third example of foam illustrated in figure 7 as a function of the diameter (D) of these cells, expressed in micrometers.

Figure 9 shows, in the form of a histogram, the frequency (F) of the pores of a sample of the third example of foam illustrated in figure 7 as a function

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of the diameter (D) of these pores, expressed in micrometers.

DETAILED DESCRIPTION OF A SPECIFIC EMBODIMENTS

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Example 1:

A batch of samples of a first example of polymer foam according to the invention was prepared by following the procedure below.

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In a first step, an organic phase was prepared, comprising 12.9 g of styrene (from Aldrich), 3.2 g of divinylbenzene (from Aldrich) and 4 g of diglyceryl monooleate (DCMO-CV from Nikkol).

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This organic phase was introduced into the vessel of a glass chemical reactor with a jacket in which a heat-exchange fluid circulates, in the case in point water maintained at 20°C by a thermostatically controlled bath. The reactor was closed by a leaktight lid pierced by 4 ground-glass necks, a central ground-glass neck of which allows a stirrer shaft to pass through and two side ground-glass necks of which serve to connect the reactor respectively to the end of a pressure-equalizing dropping funnel and to a vacuum pump.

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At the same time, an aqueous phase was prepared comprising 0.2 g of aluminum sulfate (Aldrich) and 0.6 g of sodium persulfate (Aldrich) in 290.2 ml of ultrapure water with a resistivity equal to 18.2 MΩ.

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This aqueous phase was introduced into the vessel of the reactor via the pressure-equalizing